U. S. Department of Commerce
Daniel C. Roper, Secretary

National Bureau of Standards
Lyman J. Briggs, Director

Visitors' Manual

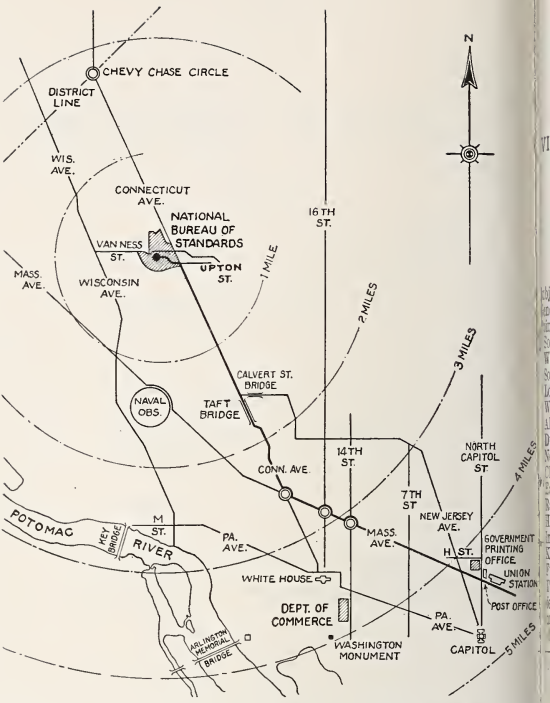
of the

National Bureau of Standards

A Brief Synopsis of Its History, Functions, and Laboratory Facilities

Miscellaneous Publication M160
(Supersedes Miscellaneous Publication M153)

U. S. GOVERNMENT PRINTING OFFICE: 1937

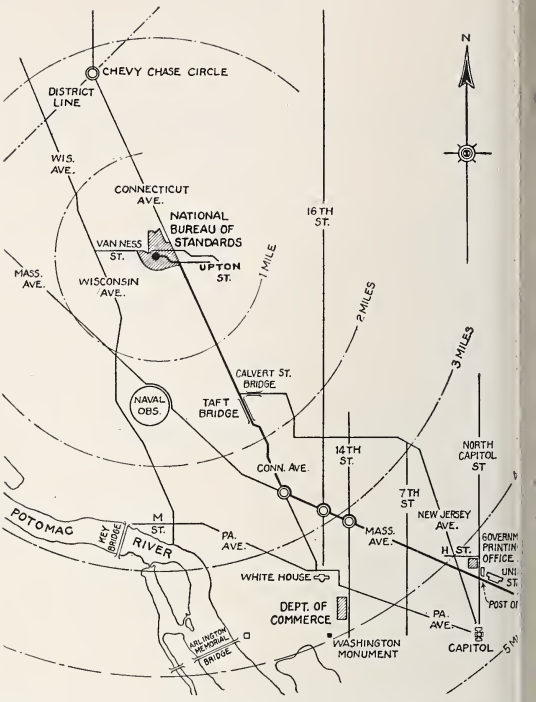


Location of the National Bureau of Standards in relation to a few of the principal streets and public buildings.

VISITORS' MANUAL OF THE NATIONAL BUREAU OF STANDARDS [1]

CONTENTS

[1] Prepared by Hugh G. Boutell, Chief, Information Section.



Location of the National Bureau of Standards in re tion to a few of the principal streets and pub buildings.

VISITORS' MANUAL OF THE NATIONAL BUREAU OF STANDARDS [1]

CONTENTS

[1] Prepared by Hugh G. Boutell, Chief, Information Section.

SUBJECTS OF BUREAU ACTIVITIES

Electricity

Resistance Measurements
Inductance & Capacitance
Electrical Instruments
Magnetic Measurements
Photometry
Radio
Underground Corrosion
Electrochemistry
Telephone Standards

Weights and Measures

Length
Mass
Time
Capacity & Density
Gas Measuring Instruments
Thermal Expansivity, Dental Materials & Identification
Weights & Meas. Laws and Adm.
Large Capacity Scale Testing
Limit Gages

Heat and Power

Thermometry
Pyrometry
Heat Measurements
Heat Transfer
Cryogenics
Fire Resistance
Automotive Power Plants
Lubrication & Liquid Fuels

Optics

Spectroscopy
Polarimetry
Colorimetry
Optical Instruments
Radiometry
Atomic Physics, Radium, & X-Rays
Photographic Technology
Interferometry

Chemistry

Paints, Varnishes, & Bituminous Materials.
Detergents, Cements, Corrosion, Etc.
Organic Chemistry
Metal & Ore Analysis, & Standard Samples
Reagents & Platinum Metals
Electrochemistry (Plating)
Gas Chemistry
Physical Chemistry
Thermo-Chemistry and Constitution of Petroleum

Mechanics and Sour

Engineering Instruments
Mechanical Appliances
Sound
Aeronautic Instruments
Aerodynamics
Engineering Mechanics
Hydraulics

Organic & Fibrous M terials

Rubber
Textiles
Paper
Leather
Testing & Specifications
Fiber Structure
Organic Plastics

Metallurgy

Optical Metallurgy
Thermal Metallurgy
Mechanical Metallurgy
Chemical Metallurgy
Experimental Foundry

Clay & Silicate Pro ucts

Whiteware
Glass
Refractories
Enameled Metals
Heavy Clay Products
Cement & Concreting I terials
Masonry Construction
Lime & Gypsum
Stone

Simplified Practice

Wood, Textiles, & Paper
Metal Products & Const tion Materials
Containers & Miscellan is Products
Materials-Handling Eq ment & Ceramics

Trade Standards

Wood, Wood Products, a per, Leather, & Rubb
Metal Products
Textiles
Apparel
Petroleum, Chemical & cellaneous Products

SUBJECTS OF BUREAU ACTIVITIES—Continued

Codes and Specifications

Safety Codes
Building Codes
Building Practice and Specifications
Producer Contacts and Certification
Consumer Contacts and Labeling

Office

Finance
Personnel
Purchase & Stores
Property & Transportation
Mail & Files
Library
Information

Shops

Instrument
Woodworking
Glassblowing
Construction Stores & Tool Room

Operation of Plant

Power Plant
Electrical
Piping
Grounds
Construction
Guard
Janitorial

GENERAL INFORMATION

History and functions.—The National Bureau of Standards was established by act of Congress, approved March 3, 1901. Besides continuing the duties of the old Office of Standard Weights and Measures of the U. S. Coast and Geodetic Survey, new scientific functions were assigned to the Bureau. It is charged with the development, construction, custody, and maintenance of reference and working standards and their intercomparison, improvement, and application in science, engineering, industry, and commerce. Originally under the Treasury Department, the Bureau was transferred in 1903 to the Department of Commerce and Labor (now the U. S. Department of Commerce).

Statistics.—The original staff numbered 14 and the laboratories were housed in temporary quarters near the United States Capitol. There are now about 870 employees, two-thirds of whom are scientifically and technically trained. The laboratories occupy 12 major and 7 minor buildings on a site of 56 acres, situated at the intersection of Upton Street and Connecticut Avenue in the northwest suburbs of Washington, 4 miles northwest from the Washington Monument. The altitude of the lower floor of the north building is 335.69 feet above mean sea level, latitude 38°56′32″ north, longitude 77°03′59″ west.

The Director of the Bureau is Dr. Lyman J. Briggs.

Those desiring other general information about the Bureau may telephone Cleveland 1720, branch 230.

Organization.—The Bureau is organized in three principal groups—the first dealing with research and testing; the second with commercial standardization; and the third with the administrative work, operation of plant, and construction of laboratory apparatus. There are 9 divisions of the first group, made up of 70 sections; 3 divisions with a total of 14 sections in the second group; and 3 divisions containing 19 sections in the third group.

Services.—The Bureau's services are available to the National and State Governments without charge. Work other than that for the Government is undertaken under certain conditions, the main consideration being the value of the work to the Nation as a whole. For private tests a fee is charged, which, however, is turned into the United States Treasury and is not available to the Bureau.

Research associates.—In addition to the regular staff, there are at the Bureau a number of research associates, supported by industrial groups to work on research problems of mutual interest to the Bureau and the industry concerned. Their status is similar to that of Bureau employees. Results of the work of research associates are public property.

Publications—The results of the Bureau's investigations are made available through its own publications and by articles in the scientific and technical journals. Several series of publications are issued by the Bureau covering various phases of the work. A list of the Bureau's publications (Circular C24 and supplements) may be purchased for 55 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Results of original research are published monthly in the Journal of Research of the National Bureau of Standards, obtainable on a subscription basis at $2.50 per year ($3.25 foreign). Semiannual volumes of the Journal of Research bound in cloth may also be purchased from the Superintendent of Documents at $3 per volume. The various papers in the Journal are also published and sold separately as Research Papers. These are numbered consecutively, as RP1, RP300, etc.

Progress of work in the laboratories, important conferences, and new publications issued can be followed in the Technical News Bulletin, issued monthly and obtainable by subscription at 50 cents per year (70 cents foreign) from the Superintendent of Documents.

Nonperiodical publications include Circulars, containing compiled information on scientific and

hnical subjects; Handbooks, usually containing ights and measures regulations, safety codes, and ilar recommended laws, standards of practice, l regulations; Simplified Practice Recommendaons, intended to reduce the number of unnecessary es and varieties of articles in common use; Building l Housing publications, covering recommended uirements for building codes, home-owner's blems, and related matters; Commercial Standls, giving acceptable standards of quality agreed on by manufacturers, distributors, and conners; and Miscellaneous Publications, generally npiled data, charts, etc., that do not fit into the er series. None of these publications is available a subscription basis.

POINTS OF SPECIAL INTEREST

The laboratories in the following list have been sen as of greatest interest to the majority of itors. Likewise they are representative of the reau's work, which includes fundamental and lied research and testing.

Special arrangements can be made to visit other oratories not listed.

Visitors' trip.—A scheduled trip through the laboories for general visitors starts from room 300, ith Building, at 1:45 p. m., daily, excepting Satlays, Sundays, and holidays. Special arrangents must be made several days in advance for ups of 10 or more. It is possible, on any one , to visit only a few of the places listed. In the e of a small group, the guide tries, as far as possi, to accommodate the interests of those making trip, but the visitor with some definite interest uld go to the laboratory concerned rather than the general trip. The sequence of buildings here en is that in which the trips are ordinarily routed.

SOUTH BUILDING

om 101—Mass section

The National Standard of Mass, Kilogram No. obtained from the International Bureau of ights and Measures, is kept in a vault on the t floor of this building. It is a plain cylinder with diameter equal to its height, and is made of an oy of 90 percent of platinum and 10 percent of lium. Weights of many different classes are comred with the Bureau's working standards, which turn are based on the National Standard. The lances used in this work include several of the

highest precision. One of these is a large balance for comparing 50-pound weights with an error of only 1 part in 20 million.

Rooms 108 and 109—Dimensional variations

Equipment is provided for determining the thermal expansivity of solids over a wide range of temperatures and with various degrees of precision, depending upon the use to which the materials are to be put.

In cooperation with the American Dental Association, great improvements have been made in dental materials and technique. The advances are all based on precision measurements.

Room 114 and corridor—Interferometry

A demonstration apparatus is arranged to show the bending of a steel bar 5 inches in diameter, under the pressure of a finger. Optical methods are employed by the Bureau in making all sorts of precision measurements of length. The equipment of this laboratory includes apparatus for constructing length standards directly from light waves.

Rooms 201 and 202—Capacity and density

Tests are made of glass volumetric apparatus and hydrometers; and the density and thermal expansion of liquids are determined.

Room 209—Length measurements

In this laboratory length-measuring instruments of all kinds are checked against the working standards of the Bureau. These in turn have been compared with the National Standard Meter No. 27 (made of the same platinum-iridium alloy as the Standard Kilogram) which is kept in the vault on the first floor of this building. High-precision length measurements are made in a special underground room, where the temperature of the standards is practically constant. (Open only by special arrangement when no work is in progress.)

Room 212—Spectroscopy

In this section the spectra of the elements are photographed, and the position and intensity of the lines determined with high precision, thus furnishing reference standards for the science of spectroscopy. The spectra of rare gases occurring in the atmosphere may be viewed through a small spectroscope. This laboratory has made important contributions to the art of photography, particularly in the production of special emulsions for photographing through haze.

ı 218—Time section

atches and clocks are here compared under rolled conditions with the Bureau's standard s, which are installed in a special room in the ment. These clocks do not vary more than one-hundredths of a second per day. They are pared daily with the standard clocks of the ed States Naval Observatory through radio ds.

n 400—Colorimetry and spectrophotometry

ıe colors of materials and illuminants are ana- l and specifications for colors are developed in section. Standard railway signal colors (of h the Bureau is the custodian), standard ıinants, United States flag colors, commercial dards for sanitary ware, and fluorescent mate- are illustrated.

WEST BUILDING

n 102—Engineering instruments

essure gages, liquid meters, anemometers, and extinguishers are among the instruments and iances tested in this laboratory. A standard for elevator interlocks was developed by this ion.

m 203—Testing of thermometers

ı this and the adjoining laboratories, mercury- lass and other types of thermometers are com- ed with the Bureau's standards by immersing ı instruments in a bath, which may contain er a low-freezing liquid, water, oil, or melted depending upon the temperature desired. The ge of temperatures covered is from −40° to ,000° F.

m 212—Pyrometry

)evices for measuring high temperatures from)0° to 4,000° F, including thermocouples, and ical and radiation pyrometers, are tested in this)ratory. The apparatus and method necessary the realization of a new primary standard of t (the Waidner-Burgess standard) were developed his section.

m 306—Optical testing of sugar

The standard test for purity of a sugar solution nade by means of an instrument known as a ccharimeter." This instrument measures the

rotation of a beam of plane polarized light passing through the solution. The Bureau also carries out research work on the properties of sugar. By special arrangement with the United States Treasury Department, the Bureau supervises the equipment and methods used in testing sugar at the U. S. Customs laboratories, which are located at the various ports of entry.

SOUND CHAMBER

Transmission, absorption, and reverberation of sound in rooms by acoustical building materials are studied in this laboratory. A revolving loudspeaker is used as the source of sound in the reverberation chamber and will be demonstrated by special arrangement.

LOW-TEMPERATURE BUILDING

The discovery of deuterium (heavy hydrogen) was the result of cooperative work between the staff of this laboratory and Columbia University. Here the production of the lowest temperature so far attained in this country, that of liquid helium (−456° F), has made possible the study of the properties of materials at very low temperatures, particularly superconductivity in metals. Liquid air (temperature −310° F) is usually on hand and its effect on the properties of common materials can be demonstrated.

WIND TUNNEL BUILDING

Main laboratory—Aerodynamics

This is one of the three wind tunnels at the Bureau employed in studying the characteristics of air flow in the tunnel itself and the behavior of model airplanes, automobiles, bombs, buildings, chimneys, etc., in an air stream. This tunnel is 54 inches across at smallest section, and in it a wind speed of 75 miles an hour can be attained.

ALTITUDE LABORATORY

This was the first laboratory ever built for studying the performance of aircraft engines under flight conditions. It was completed in 1917. The low air pressures and temperatures encountered at altitudes up to 30,000 feet can be duplicated. It is suitable only for liquid-cooled engines, and consequently is not often used at the present time, but the fundamental facts brought out as the result of this pioneer work are applicable to all engines.

DYNAMOMETER BUILDING

Main laboratory—Automotive power plants

Investigations are conducted in this laboratory on the performance of internal-combustion engines with special reference to fuels, lubricants, and devices intended to promote economy and efficiency. The equipment includes electric dynamometers to which any engine may be coupled. A special test plant is provided for studying modern air- or liquid-cooled aircraft engines, and there are many pieces of special apparatus for testing fuels, lubricants, and ignition systems.

NORTHWEST BUILDING

Basement—Experimental foundry and metal-working equipment

In this laboratory alloys can be prepared by melting in induction, electric-arc, or gas-fired furnaces, and can be cast, rolled, forged, or drawn into the shape desired. The equipment employed is similar to that used in actual mill practice but on a smaller scale.

Room 105—Microstructure of metals

The crystalline structure of metals and alloys is studied in this laboratory and in adjoinging rooms. The effect of working, heat treatment, corrosion, etc., can be determined.

Room 202—Gages

This section is engaged in testing precision gages used for controlling the dimensions of machine parts. By the optical methods used in these laboratories, the lengths of gages can be determined to one-millionth of an inch.

Room 203—Library

The Bureau has a library of nearly 42,000 volumes on physics, chemistry, and engineering. It receives practically all the domestic and foreign periodicals in these fields. Its facilities are utilized by research workers from all parts of the country.

Room 311—Aeronautic instruments

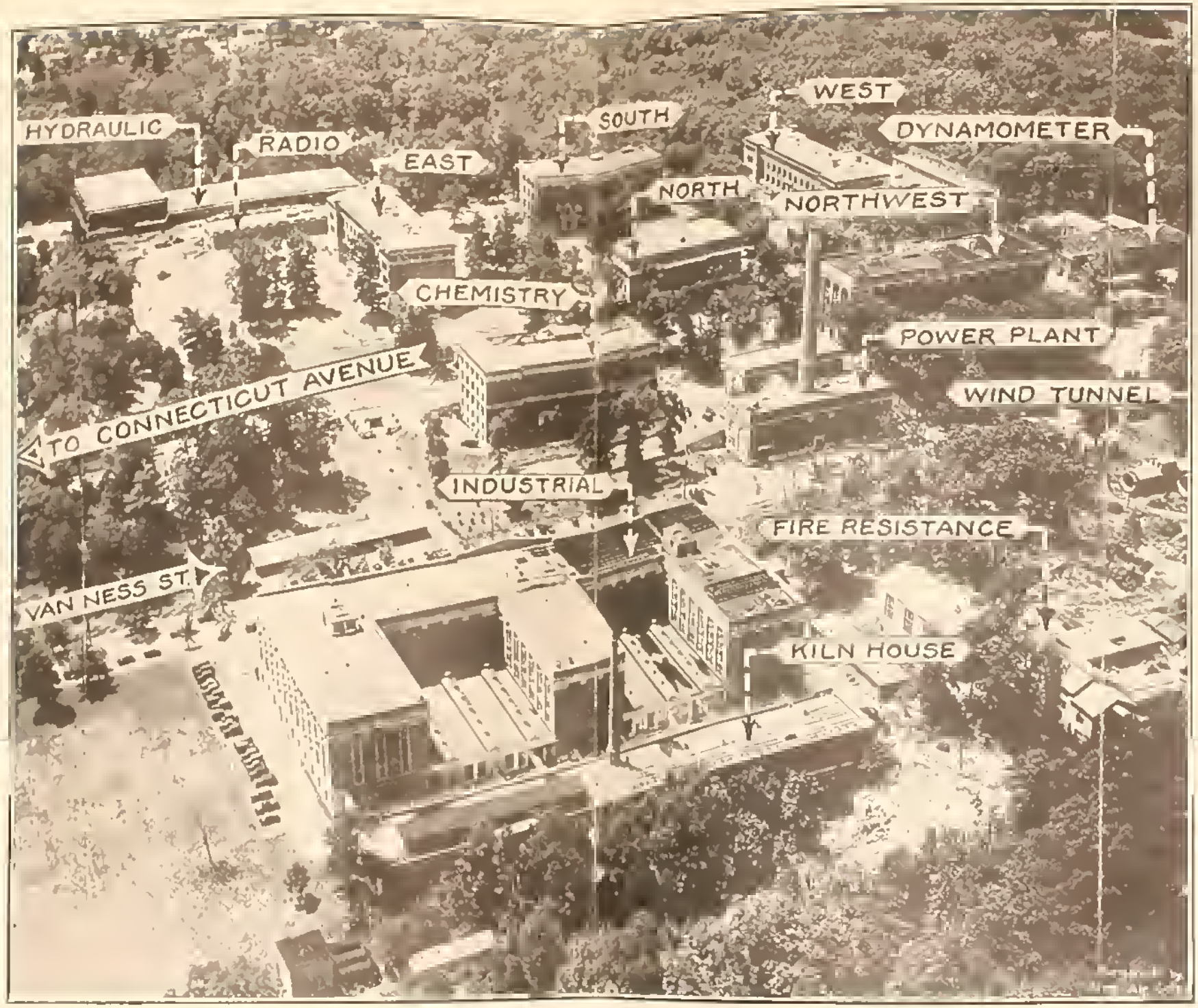
Testing of aeronautic instruments for scale errors, effect of temperature and pressure, elastic defects, vibration, and other factors affecting the performance of these instruments constitutes the work of this section. Fundamental research and a certain amount of development work on special instruments are also being carried on.

Airplane view of the N
[Loc

The names of the principal buildings are shown. The main entrance to t
trip through the laboratories starts at 1:45 p. m. fr

ional Bureau of Standards
g south]

Bureau's grounds is on Connecticut Avenue, to the left of this picture. The room 300, South Building, shown near the top center.



Airplane view of the National Bureau of Standards
[Looking south]

The names of the principal buildings are shown. The main entrance to the Bureau's grounds is on Connecticut Avenue, to the left of this picture. The trip through the laboratories starts at 1:45 p. m. from room 300, South Building, shown near the top center.

CHEMISTRY BUILDING

Room 8—Electrochemistry

As the result of work conducted in cooperation with the electroplating industry, important improvements have been made in processes for chromium plating and for the rapid deposition of copper. The equipment includes a small electroplating plant, used for preparing specimens for exposure and laboratory tests.

Rooms 14–C and 318–C—Standard samples

The preparation and distribution of standard samples of ores, ceramic materials, metals, and pure chemicals are conducted in these laboratories.

Room 112—Electrochemistry

The equipment of this laboratory is used for measuring conductivity and hydrogen-ion concentration.

Room 205—Gas chemistry

Special equipment is provided in the gas chemistry section for testing gas appliances, particularly as regards safety. Several devices are installed for the rapid analysis of products of combustion and of mixtures being burned. The laboratory is of great interest to those engaged in the study of the utilization of gas.

Room 208—Gas chemistry

Here will be seen a considerable variety of apparatus for the analysis of gases, especially some very well-designed equipment for volumetric analysis, and elaborate apparatus for the fractionation of gases by distillation.

Room 211 and shaft in corridor—Petroleum

The equipment of this section includes unique stills for the fractional distillation of petroleum, an important step in determining its composition.

Room 303—Organic chemistry

Pure crystalline rubber has been produced in this section.

Room 410—Apparatus for determining hiding power of paint

Accelerated-weathering equipment for organic protective coatings and apparatus for determining the breakdown of protective coatings are among the special features of this laboratory.

(NOTE.—A special mimeographed guide to the laboratories in the Chemistry Building may be obtained on application at the Chief Chemist's office, room 215.)

EAST BUILDING

Rooms 106 and 107—Tests of electrical measuring instruments

This laboratory is provided with a special switchboard for connecting different circuits, and an optical device for reading the scale of an instrument with great accuracy.

Room 109—Heavy-current testing

Tests are made up to 10,000 amperes, current being supplied from a special storage battery.

Room 111—Resistance measurements

The oil bath in which wire standards of resistance are immersed during test contains a special stirring arrangement and temperature control. Precision standards for other laboratories are thus compared at a constant temperature with the standards which represent the Bureau's basic unit of electrical resistance.

Room 307—Life tests of incandescent lamps

Each year several thousand lamps, representing Government purchases of about 3,000,000 lamps per annum, are tested to ascertain whether they comply with the Federal specification requirements for rating and life.

Room 314—Integrating sphere for determining the mean spherical candlepower of lamps

By means of a hollow sphere, the inside surface of which is painted white, and at the center of which is placed the lamp, the total amount of light given off in all directions by any electric lamp is determined by a single measurement.

Room 317—Tests of radium and development of radio meteorograph

Practically all radium sold in the United States is tested in this laboratory. The rate of gamma radiation is compared by means of an electroscope with that of a standard sample.

A special meteorographic apparatus and radiotransmitting set have been developed in this laboratory in cooperation with the U. S. Weather Bureau. These instruments are attached to sounding balloons

and send back automatic signals giving weathe conditions at altitudes up to 20 miles.

Room 407—Optical instruments

This laboratory is equipped for testing lenses including the highest grade of photographic lense used in airplane mapping.

Room 408—Standard cells

In this laboratory the Weston normal saturate cells, by which the standard of voltage is maintaine for the United States, are kept, and compared wit the standards of voltage of other nations.

RADIO BUILDING

Main hall—Museum and library

Here will be found an exhibit showing variou types of electron tubes, French and American radi sets used in the World War, miscellaneous apparatu developed for research, and publications, reports, an books of the radio section.

Rooms 213–214—Standard of radio-frequency

In this laboratory is located the Bureau's funda mental standard of radio-frequency, consisting o six quartz oscillators and auxiliary apparatus The frequency as obtained from this standard doe not differ from the true frequency by more than on part in 10,000,000.

(NOTE.—Other parts of the radio work may b seen by special arrangement with the section office.)

HYDRAULICS BUILDING

This building, which is 285 feet long and from 6 to 92 feet wide, contains supply and measuring ba sins, flumes, and pumping and metering equipment for every variety of hydraulic investigation, includ ing experiments with models of large structures A maximum flow of 250 cubic feet per second is pos sible in the main flume, which is 12 feet square an 200 feet long. (Open to visitors by special arrange ment with chief of the section.)

INDUSTRIAL BUILDING

Basement, west end—Cement-, concrete-, and stone testing equipment

Samples from about 70 percent of all cement which the Government buys are tested by the Bureau, but most of this work is done in field laboratories rather than in Washington.

ısement, center—Large testing machines for structural materials

The vertical machine on the west side of the room s the greatest capacity of any machine in the ›rld, 10,000,000 pounds in compression. On the st is a 600,000-pound machine for either tension or mpression, and specially designed for testing ams. In the room next to this machine is the nery high-precision testing machine with a capac- ⁊ of 2,300,000 pounds in compression and 150,000 pounds in tension.

›om 25—Optical glass

Here are shown examples of glass produced by e Bureau and the method used in examining glass r striae and strain.

›om 136—Textiles

The equipment includes many special machines r determining properties of textiles. Tests of xtiles and paper are made in a room in which e humidity and temperature are automatically ›pt constant.

›om 107—Paper

The Bureau has a complete papermaking plant, cluding a paper machine for making a sheet 29 ches in width, with which improvements in pro- sses and the use of new materials can be studied. ı particular, the life of paper, including the paper ›ed by the Government for printing currency, has ›en increased three or four hundred percent through ıe research work of this laboratory. Considerable tention has been given to the most effective ethods for preserving important books and docu- ents in libraries. The Declaration of Independ- ıce and Constitution have been protected from traviolet rays, following methods worked out by ıe Bureau.

oom 227—Rubber

The work of this section occupies several labora- ›ries on this floor and in the basement. Automobile res are tested for power loss and endurance, on ›ecial machines which simulate service conditions ıd greatly shorten the time needed for a test.

oom 307—Organic plastics

This section is engaged in studying plastic mate- als used for a great variety of purposes, including rcraft windows, electrical panels, household arti- es, and ornamental trimmings for buildings.

Room 319—Leather

In this and adjacent laboratories may be se samples of leather made from various kinds of hid a machine for measuring the durability of shoes, a investigations of tanning solutions. Means f increasing the life of leather, and for combati deteriorating influences, such as sulphuric acid the atmosphere, are receiving particular attentio

Room 336—pH *measurements*

The amount of active acid present in materials h an important effect on their useful life. Methods f measuring this quantity are being developed in th laboratory.

KILN BUILDING

East end—Optical-glass plant

The Bureau operates one of the few plants no making optical glass in the United States. Most the glass made here is used by the Navy Departmen for binoculars, gun sights, periscopes, and simil devices. The equipment includes machinery f making pots, melting and annealing furnaces, an instruments for determining quality of glass.

Center

Furnaces are installed for ceramic material, an for enameling metals. An automatic electricall heated kiln will prove of interest to ceramists.

West end

This large room contains a rotary cement kiln an ball mills for experimental production of cement.

FIRE-RESISTANCE GROUP

West of the Industrial Building is a group of stru tures in which tests are made to determine the i tensity and duration of fires and the fire resistanc of building materials and constructions. The equip ment includes a large furnace for wall panels an another for testing safes.

TEN-FOOT WIND TUNNEL

This outdoor wind tunnel, located just west of th fire-resistance group, has a diameter of 10 feet and maximum wind speed of 75 miles per hour. Test on large models of buildings, chimneys, full-sized ai plane wing sections, etc., are made in this tunnel.

A FEW NOTABLE ACCOMPLISHMENTS

The National Bureau of Standards—

Redetermined the constant of gravitation with accuracy 10 times as great as ever before obtained.

Carried out researches on density and thermal pansion of liquids of importance in industry, and iculated standard density and volumetric tables at are widely accepted; for example, ethyl alcohol, troleum oils, linseed oil, turpentine, milk and eam.

Cooperated with the American Petroleum Institte in setting up standards for oil-country tubular ods, pumping equipment, etc., and in the standlization and inspection of limit gages necessary maintenance of these standards.

Cooperated with the National Screw Thread mmission in setting up screw thread standards d standard methods of inspection.

Constructed the first altitude laboratory for easuring the performance of airplane engines under ght conditions.

Developed the radiobeacon which, in combination th a special aerial and receiving set on the airane, gives the pilot a visual switchboard indication whether he is following the correct course.

Discovered that a thin coating of pure aluminum ll greatly decrease the atmospherie corrosion of ralumin, a special light alloy largely used in craft construction.

Worked out successful process for plating steel d other metals with chromium, the hardest metal own, thus prolonging the life of gages, printing ates, and other mechanical parts several hundred rcent.

Developed the paper now used for printing United ates currency, with strength increased three or ur times, resulting in increased service life.

Discovered that certain waste water from paper lls makes a satisfactory material for tanning ther.

Established the dextrose (corn sugar) industry.

Made three standards for planeness for testing ges, flat to within one five-millionth of an inch.

Constructed standards of length from fused artz, known to 1 part in 5,000,000.

Commenced experiments in making optical glass 1914 and at last solved the difficult technique, so at optical glass of many grades is now produced as routine matter.

Designed and constructed many special instr ments, such as strain gages, proving rings, texti and paper testers, etc.

Assisted in securing the adoption of a unifor international temperature scale by the Internation Conference on Weights and Measures.

Published books on house construction and repai home ownership, zoning regulations, and plumbi requirements.

Helped to eliminate unnecessary variety of siz and styles of over 160 articles in common us securing agreement of manufacturers to concentra on production of those in greatest demand, th lowering cost of manufacture and distribution.

Assisted industry in agreeing on satisfacto standards of quality for over 60 products, and pu lished the results as commercial standards.

Published National Directory of Commodit Specifications and developed certification and labe ing plan for making available to both large ar small purchasers the benefits of buying by specific tion.

NUMBER OF PUBLICATIONS ISSUED

During the fiscal year 1937 the number of pape published in the monthly Journal of Research of tl National Bureau of Standards was 107. In add tion, the Technical News Bulletin was issued ea month. Thirty-seven papers were published other series of the Bureau, including Simplifi Practice Recommendations, Commercial Standard Circulars, Handbooks, and Miscellaneous Public tions. In addition, 128 papers were published in ou side scientific and technical journals.

VOLUME OF TESTING

In 1 year the National Bureau of Standards teste approximately—

1,440 electrical standards and instruments.
2,040 electric batteries.
6,550 electric lamps, representing purchases 3,000,000 lamps by the Government.
3,190 gages and samples of gage steel.
5,110 weights and balances.
1,800 scales.
420 timepieces.
13,700 pieces of glass volumetric apparatus.
1,820 hydrometers.
2,360 laboratory thermometers.

600 clinical thermometers.
270 samples of engine fuels and lubricants.
770 samples of sugar.
640 samples of radium and radioacitve materials determining a sale price of $1,000,000.
630 engineering instruments.
035 aeronautic instruments.
360 specimens of engineering materials.
200 fusible boiler plugs.
700 samples of metals and alloys.
000 samples of cement and concrete, representing purchases of 5,000,000 barrels of cement.
550 miscellaneous samples of ceramic materials.
520 samples of rubber.
220 samples of textile materials.
340 samples of paper.
620 samples of leather.
450 samples of paint and varnish.

addition to the above, 2,680 miscellaneous nical tests were made and 8,620 standard samples distributed.

○